

UNIVERSITY OF BAHRAIN  
COLLEGE OF INFORMATION TECHNOLOGY  
DEPARTMENT OF COMPUTER SCIENCE  
ITCS252 DISCRETE MATHEMATICS  
FIRST SEMESTER 2011/2012

FIRST EXAM — 1 HOUR.

Time: 2:00 – 3:00 PM

STUDENT NAME	
STUDENT#	
SECTION	

QUESTION#	MARKS		REMARKS
1	7		
2	8		
3	8		
4	4		
5	8		
TOTAL	35		

**Instructors:** Dr. Ali Alsaffar  
Dr. Rakesh Singh

**Q1. [7 points]** The truth table for NAND operation ( $\uparrow$ ) is defined as

$p$	$q$	$p \uparrow q$
T	T	F
T	F	T
F	T	T
F	F	T

Use truth table to show whether the following is true or false.

$$p \wedge (q \vee r) \equiv (p \uparrow (q \vee r)) \uparrow (p \uparrow (q \vee r))$$

This image shows a blank sheet of white paper with horizontal red ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings on the paper.

**Q2.** [8 points] Let  $p, q$ , and  $r$  be the propositions defined as

$p$  : “I am thirsty”.

$q$  : “My glass is empty”.

$r$  : “It is three o’clock”.

Write the following statements in symbolic form.

(a) I am thirsty and my glass is not empty if it is three o'clock.

(b) It is three o'clock whenever I am thirsty.

(c) It is not the case that it is three o'clock and my glass is empty.

(d) My glass is empty unless it is three o'clock and I am not thirsty.

**Q3. [8 points]** Let  $E(x) :$  “ $x$  is an even integer”  
 $P(x) :$  “ $x > 0$ ”  
 $D(x, y) :$  “ $y$  is divisible by  $x$ ”

Assume the domain is the set of integers  $\mathbb{Z}$ , write each of the following in formal symbolic form using *only* the above predicates and appropriate quantifiers.

(a) Every positive and even integer is divisible by 2.

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(b) Some none-positive odd integers are not divisible by 2.

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(c) No positive integer divisible by 9 is divisible by 11.

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(d) The successor of every even integer is odd.

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**Q4. [4 points]** A Mobile Phone shop displays the sign “*Good mobile phone is not heavy*”, and a competing shop displays the sign “*Mobile phone not heavy is good*”.

(1) **[2 pts.]** Let  $g$  be “Mobile phone is good” and  $h$  be “Mobile phone is heavy”. Convert the above two signs into symbolic form.

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(2) **[2 pt.]** Are the two signs equivalent? Justify your answer.

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This image shows a full page of blank handwriting practice paper. It features 20 evenly spaced horizontal red lines across the entire page, providing a guide for letter height and placement. The background is plain white, and there are no margins or additional markings.